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VIII. *Notice on the Iguanodon, a newly discovered fossil reptile, from the sandstone of Tilgate forest, in Sussex.* By GIDEON MANTELL, F. L. S. and M. G. S. *Fellow of the College of Surgeons, &c.* In a Letter to DAVIES GILBERT, Esq. M. P. V. P. R. S. &c. &c. &c. Communicated by D. GILBERT, Esq.

Read February 10, 1825.

SIR,

I AVAIL myself of your obliging offer to lay before the Royal Society, a notice of the discovery of the teeth and bones of a fossil herbivorous reptile, in the sandstone of Tilgate forest; in the hope that, imperfect as are the materials at present collected, they will be found to possess sufficient interest to excite further and more successful investigation, that may supply the deficiencies which exist in our knowledge of the osteology of this extraordinary animal.

The sandstone of Tilgate forest is a portion of that extensive series of arenaceous strata, which constitutes the iron-sand formation, and in Sussex forms a chain of hills that stretches through the county in a W. N. W. direction, extending from Hastings to Horsham. In various parts of its course, but more particularly in the country around Tilgate and St. Leonard's forests, the sandstone contains the remains of saurian animals, turtles, birds, fishes, shells, and vegetables. Of the former, three if not four species belonging to as many genera are known to occur, viz. the crocodile, megalosaurus, plesiosaurus, and the iguanodon, the animal whose teeth

form the subject of this communication. The existence of a gigantic species of crocodile in the waters which deposited the sandstone, is satisfactorily proved by the occurrence of numerous conical striated teeth, and of bones possessing the osteological characters peculiar to the animals of that genus ; of the megalosaurus, by the presence of teeth and bones resembling those discovered by Professor BUCKLAND in the Stonesfield slate ; and of the plesiosaurus, by the vertebræ and teeth analogous to those of that animal.

The teeth of the crocodile, megalosaurus and plesiosaurus, differ so materially from each other, and from those of the other lacertæ, as to be identified without difficulty ; but in the summer of 1822, others were discovered in the same strata, which although evidently referable to some herbivorous reptile, possessed characters so remarkable, that the most superficial observer would have been struck with their appearance, as indicating something novel and interesting. As these teeth were distinct from any that had previously come under my notice, I felt anxious to submit them to the examination of persons whose knowledge and means of observation were more extensive than my own ; I therefore transmitted specimens to some of the most eminent naturalists in this country, and on the continent. But although my communications were acknowledged with that candour and liberality which constantly characterises the intercourse of scientific men, yet no light was thrown upon the subject, except by the illustrious Baron CUVIER, whose opinions will best appear by the following extract from the correspondence with which he honoured me.

“ Ces dents me sont certainement inconnues ; elles ne sont

point d'un animal carnassier, et cependant je crois qu'elles appartiennent, vu leur peu de complication, leur dentelure sur les bords, et le couche mince d'émail qui les revêt, à l'ordre des reptiles. A l'apparence extérieure on pourrait aussi les prendre pour des dents de poissons analogues aux tetrodons, ou aux diodons ; mais leur structure intérieure est fort différente de celles là. N'aurions-nous pas ici un animal nouveau, un reptile herbivore ? et de même qu'actuellement chez les mammifères terrestres, c'est parmi les herbivores que l'on trouve les espèces à plus grande taille, de même aussi chez les reptiles d'autrefois, alors qu'ils étaient les seuls animaux terrestres, les plus grands d'entr'eux ne se seraient-ils point nourris de végétaux ? Une partie des grands os que vous possidez appartiendrait à cet animal, unique, jusqu'à présent, dans son genre. Le tems confirmera ou infirmera cette idée, puisqu'il est impossible qu'on ne trouve pas un jour une partie du squelette réunie à des portions de mâchoires portant des dents. C'est ce dernier objet surtout qu'il s'agit de rechercher avec le plus de persévérance."

These remarks induced me to pursue my investigations with increased assiduity, but hitherto they have not been attended with the desired success, no connected portion of the skeleton having been discovered. Among the specimens lately collected, some however were so perfect, that I resolved to avail myself of the obliging offer of Mr. CLIFT, (to whose kindness and liberality I hold myself particularly indebted) to assist me in comparing the fossil teeth with those of the recent lacertæ in the Museum of the Royal College of Surgeons. The result of this examination proved highly

satisfactory, for in an Iguana which Mr. STUTCHBURY had prepared to present to the College, we discovered teeth possessing the form and structure of the fossil specimens.

In the annexed drawing, Plate XIV. examples of the recent and fossil teeth are represented, and the peculiar characters of each accurately shown; a description of it in this place will render the subsequent observations more intelligible.

Fig. 8 represents a portion of the upper jaw of the iguana viewed from within; it is magnified four diameters.

9 *a* shows the inner, and 9 *b* the outer surface of a tooth of the same, greatly magnified. It may be proper to remark, that the teeth differ considerably in the number of points, and that the eminence at *f*, fig. 9 *a*, is sometimes the first or second in the series, instead of being the third, as in the figure. In some teeth the points vary but little in size; they are more distinct on the edges of the teeth occupying the centre of the jaw, than in the anterior and posterior ones. The skeleton from which the drawings were made is three feet six inches in length. It is said to be the common edible iguana of the West Indies, but I have not been able to ascertain its species with certainty. The remaining figures represent different examples of the fossil teeth.

Fig. 1. *a* represents the outer, and fig. 1. *b* the inner surface of one of the largest and most perfect specimens of the teeth of the iguanodon. As the letters of reference in each figure indicate the same parts, they are explained here to avoid repetition.

a. Surface worn by mastication.

b. The serrated edges.

c. Fang broken; the cavity filled with sandstone.

d. Cavity or depression in the base of the fang, the effect of absorption caused by the pressure of a secondary tooth.*

e. Ridge extending down the front of the tooth.

Fig. 2. This tooth evidently belonged to a young animal; yet even in this example the apex is worn away, (see *a.* fig. 2 *c.*) The ridge extending down the front (see *e* fig. 2 *a.*) is more or less distinct in every specimen.

Fig. 3. A tooth much worn by mastication. The serrated edges and other characters are obliterated, the tooth being worn down to the point marked by the line at *g.* fig. 1. *a.* The fang has been removed by absorption; and the cavity formed by the pressure of the new tooth is very deep.

Fig. 4. In this specimen the point is perfect, and it therefore more closely resembles the recent tooth (fig. 9.) than those above described.

5. Is another example, where the point is but little worn.

6. A large strong tooth less curved than fig. 1 and 2. It probably occupied a place in the posterior part of the jaw.

7. In this figure, the cavity of the base of the fang for the reception of the new tooth is remarkably distinct.

The teeth above described, although varying from each other in some particulars, do not present greater dissimilarity than the differences arising from age, and the situation they respectively occupied in the jaw, would be liable to produce. Like the teeth of the recent iguana, the crown of the tooth is acuminate; the edges are strongly serrated or

* The hollow here described is so constantly found in every example, that it cannot be accidental. From the close resemblance it bears to the cavity formed in the base of the fangs of the recent iguana, by the secondary teeth, (Vide *d.* fig. 8) it may be confidently presumed that it is the effect of a similar cause.

dentated ; the outer surface is ridged, and the inner smooth and convex ; and as in that animal the secondary teeth appear to have been formed in a hollow in the base of the primary ones, which they expelled as they increased in size. From the appearance of the fangs in such fossil teeth as are in a good state of preservation, it seems probable that they adhered to the inner side of the maxillæ, as in the iguana, and were not placed in separate alveoli, as in the crocodile. The teeth appear to have been hollow in the young animals, and to have become solid in the adult. The curved teeth (figs. 1, 2.) probably occupied the front of the jaw ; and those which are nearly straight, (fig. 3.) the posterior part.

It appears unnecessary to dwell longer on the resemblance existing between the recent and fossil teeth. Whether the animal to which the latter belonged, should be considered as referable to existing genera, differing in its specific characters only ; or should be placed in the division of enalio-sauri of Mr. CONYBEARE, which includes marine genera only, cannot at present be determined. If however any inference may be drawn from the nature of the fossils with which its remains associated, we may conclude, that if amphibious, it was not of marine origin, but inhabited rivers or fresh-water lakes ; in either case the term IGUANODON, derived from the form of the teeth, (and which I have adopted at the suggestion of the Rev. W. CONYBEARE) will not, it is presumed, be deemed objectionable.

It has already been mentioned, that of the bones of oviparous quadrupeds found in the sandstone of Tilgate forest, some are decidedly referable to the crocodile, and others to the megalosaurus and iguanodon ; but our knowledge of the

osteology of the latter is at present so limited, that until some connected portion of the skeleton shall be discovered, it is impossible to distinguish the bones of the one from those of the other. Since, however, the teeth of the iguanodon are not known to occur in the Stonesfield slate, perhaps such of the bones from Tilgate forest as resemble those figured and described by Professor BUCKLAND, in Vol. I. Second Series of the Geological Transactions, may be attributed to the megalosaurus; while others not less gigantic may be assigned to the iguanodon. That the latter equalled, if not exceeded the former in magnitude, seems highly probable; for if the recent and fossil animal bore the same relative proportions, the tooth, fig. 1. must have belonged an individual upwards of sixty feet long; a conclusion in perfect accordance with that deduced by Professor BUCKLAND from a femur,* and other bones in my possession.

The vertebræ, as in the greater part of the fossil saurians, differ very materially from those of the recent iguana, crocodile, &c. They are not concave anteriorly, and convex posteriorly, but have both faces slightly depressed, resembling in this respect the vertical column of one of the fossil crocodiles of Havre and Honfleur. But among the recent lacertæ there are some, as the Proteus of Germany, the Syren of Carolina, and the Axolotl of Mexico, in which the vertebræ are deeply cupped at both extremities; and since the fossils in question are clearly of the saurian type, having the annular part united to the body of the vertebra by

* Vide Professor BUCKLAND's notice on the Megalosaurus. Geol. Trans. Vol. I. Second Series, p. 391.

suture, the discrepancy alluded to does not appear to be sufficiently important to invalidate the accuracy of the opinions which I have attempted to establish.

I have the honor to be,

SIR,

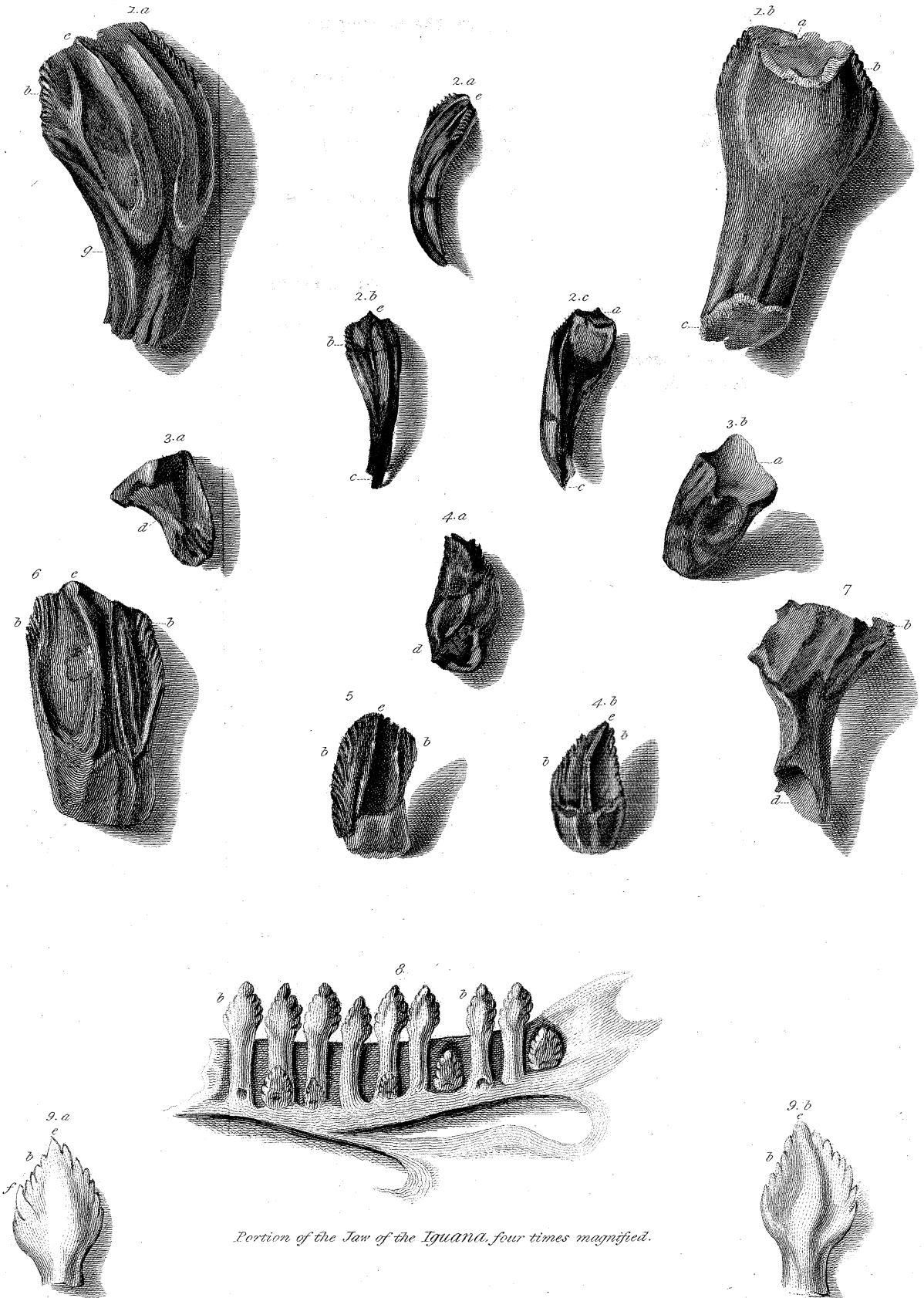
your most obedient Servant,

GIDEON MANTELL.

Castle Place, Lewes,

Jan. 1, 1825.

Teeth of the IGUANODON a newly discovered FOSSIL ANIMAL, from the Sandstone of TILGATE FOREST, in SUSSEX.



Portion of the Jaw of the Iguana, four times magnified.